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Perman & Green, LLP 99 Hawley Lane Stratford, CT 06614			EXAMINER BALL, JOHN C	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/559,958	<b>Applicant(s)</b> MANZ ET AL.	
	<b>Examiner</b> J. CHRISTOPHER BALL	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 13 April 2010.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-12, 15-50, 53-81 and 84-99 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12, 15-50, 53-81 and 84-99 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)         | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Summary***

1. This Office Action is based on the Reply to Office Action filed with the Office on April 13, 2010, regarding the MANZ et al. application.
2. Claims 1-12, 15-50, 53-81, and 84-99 are currently pending and have been fully considered.

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:
  1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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3. Claims 1-12, 15-50, 53-81, and 84-99 are rejected under 35 U.S.C. 103(a) as being unpatentable over an article by RAYMOND et al. ("Continuous Sample Pretreatment Using a Free-Flow Electrophoresis Device Integrated onto a Silicon Chip", ANALYTICAL CHEMISTRY, vol. 66, September 15, 1994, p. 2858-2865) in view of OAKLEY et al. (US 2003/0159999 A1).

Regarding claim 1, RAYMOND teaches a free flow electrophoresis microchip, comprising:

a separation chamber comprising a planar chamber (Figure 3) having a planar region (separation bed, Figure 3), in which charged components are in use separated (separation bed, Figure 3);

a plurality of separation medium inlet channels having outlets fluidly connected to one inlet side of the separation chamber (1 and 2, Figure 2; left carrier inlet and right carrier inlet, Figure 3) through which flows of a separation medium are in use introduced into the separation chamber such as to develop a laminar flow (second paragraph, Silicon Device section, p. 2860) having a flow direction through the separation chamber (carrier flow indication, Figure 1);

a sample inlet channel having an outlet fluidly connected to the inlet side of the separation chamber (3, Figure 2; sample inlet, Figure 3) through which a flow of sample containing charged components is in use introduced into the separation chamber (first paragraph, Amino Acid Separation section, p. 2863; Figure 1); and

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whereby charged components introduced into the separation chamber are deflected laterally across the separation chamber in dependence upon the charge of the charged components (Figure 1).

RAYMOND suggests a plurality of outlet channels having inlets fluidly connected to another outlet side of the separation chamber opposite the inlet side thereof (second paragraph, Silicon Device section, p. 2860), although this design was not utilized in the described invention to simplify fabrication of the initial device.

RAYMOND does not teach a magnetic field unit.

However, OAKLEY discloses a microfluidic device, wherein is taught a magnetic field unit for providing a magnetic field substantially orthogonal, wherein the magnetic field is directed substantially orthogonally to a planar region of a microchannel (44 and 92, Figure 3), to the flow direction of a separation medium in a microfluidic format (92, Figure 3; paragraph [0058]).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to modify the device as described by RAYMOND with the addition of the magnetic field unit as taught by OAKLEY because it would allow use of surface charge to be observed for distinguishing a particular particle in a sample (OAKLEY, paragraph [0047]).

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Regarding claim 2, RAYMOND teaches outlets of the separation medium inlet channels are disposed in a spaced relation along the inlet side of the separation chamber (Figure 3).

Regarding claim 3, RAYMOND teaches the outlet of the sample inlet channel is disposed in a central region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 4, RAYMOND teaches the outlet of the sample inlet channel is disposed in an end region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 5, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels face in the same direction (Figures 2 and 3).

Regarding claim 6, RAYMOND teaches the separation medium inlet channels are commonly fluidly connected (Figure 2).

Regarding claim 7, RAYMOND teaches groups of ones of the separation medium inlet channels are commonly fluidly connected (Figure 3).

Regarding claim 8, RAYMOND teaches the separation medium inlet channels are separately fluidly connected (Figure 3).

Regarding claim 9, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels are disposed in opposed relation to the inlets of the outlet channels (Figure 2).

Regarding claim 10, RAYMOND suggests the inlets of the outlet channels have a depth at least as great as that of the separation chamber, in that the proposed outlet array is identical to the inlet channel array (second paragraph, Silicon Devices section, p. 2860) and the inlet channel array is shown to have a depth at least as great as that of the separation chamber (Figure 3).

Regarding claim 11, RAYMOND teaches the inlets of the outlet channels are disposed in a spaced relation along the outlet side of the separation chamber (Figure 2).

Regarding claim 12, RAYMOND teaches the inlets of the outlet channels are equally spaced (Figure 2).

Regarding claim 15, RAYMOND teaches the separation chamber has a depth of 50  $\mu\text{m}$  (first paragraph, Silicon Devices section, p. 2859).

Regarding claims 16-18, RAYMOND, as modified by OAKLEY in claim 1, teaches a magnetic field unit that is a field generator (OAKLEY, paragraph [0058]). Neither RAYMOND nor OAKLEY teach the magnetic field unit is a magnet in the form of a Ni-Fe permalloy magnet, which is a well-known magnetic material.

However, at the time of the present invention, it would have been obvious to one of ordinary skill in the art to substitute a known element in the field generator, as taught by OAKLEY, as the magnetic field unit for another known element, a Ni-Fe permalloy magnet, with a predictable result (*KSR International Co. v. Teleflex Inc.*, 550 U.S. \_\_\_, 82 USPQ2d 1385 (2007)).

Regarding claim 19, RAYMOND teaches the microchip further comprising:  
a first and second electrode unit (third paragraph, Silicon Devices section, p. 2860) disposed at respective ones of other lateral sides of the separation chamber (8 and 9, Figure 2).

Regarding claim 20, RAYMOND teaches the electrode units each comprise an electrolyte reservoir disposed adjacent the respective lateral side of the separation chamber (8 and 9, Figure 2; side beds, Figure 3) for containing a volume of an electrolyte medium, by virtue of having their own inlets (4 and 5, Figure 2) and outlets (6 and 7, Figure 2), and a plurality of connection channels



fluidly connecting the electrolyte reservoir to the respective lateral side of the separation channel (side channel arrays, Figure 3).

Regarding claim 21, RAYMOND teaches each electrolyte reservoir has substantially the same length as the separation chamber (Figure 2).

Regarding claim 22, RAYMOND teaches the connection channels are disposed in a spaced relation along the respective lateral sides of the separation channel (Figure 3).

Regarding claim 23, RAYMOND teaches the connection channels are equally spaced (Figure 3).

Regarding claim 24, RAYMOND teaches the connection channels are 12  $\mu\text{m}$  wide (first paragraph, Silicon Devices section, p. 2859-2860). RAYMOND does not explicitly teach the connection channels have a width from about 1  $\mu\text{m}$  to about 5  $\mu\text{m}$ . However, it has been held where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device (*Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984)).

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Therefore, it would be obvious to one of skill in the art, given the width taught by RAYMOND to utilize a width in the range from about 1  $\mu\text{m}$  to about 5  $\mu\text{m}$  as it is merely a simple change in dimension that would not perform a different function as the width explicitly taught by RAYMOND.

Regarding claim 25, RAYMOND teaches the electrode unit each further comprises an electrode element disposed in the respective electrolyte reservoir (third paragraph, Silicon Devices section, p. 2860).

Regarding claim 26, RAYMOND, as modified by OAKEY, teaches all the limitations of claims 1 and 19 for a free flow electrophoresis microchip, as outlined above. Additionally, RAYMOND teaches a high-voltage supply for applying an electric field between the electrode units and across the separation chamber (last two sentences, Equipment and Data Acquisition section, p. 2860) in a direction that would substantially orthogonal to the magnetic field as taught by OAKEY (RAYMOND, Figure 1). The combination of the electric field and magnetic field would inherently yield a magnetohydrodynamic flow of sample and separation medium in the separation chamber.

Regarding claim 27, RAYMOND, as modified by OAKEY, teaches all the limitations of claims 1 and 19 for a free flow electrophoresis microchip, as outlined above. Additionally, RAYMOND teaches a supply unit for supplying

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flows of sample and separation medium through the respective ones of the sample inlet channel and the separation medium inlet channels and into the separation chamber (fifth sentence, Equipment and Data Acquisition section, p. 2860); whereby an electric field is induced across the separation chamber in a direction substantially orthogonal to the flow direction (Figure 1).

Regarding claim 28, RAYMOND teaches the supply unit comprises a first transfer unit, in the form of external fluid lines (second paragraph, Silicon Devices section, p. 2860) and syringe pumps (Equipment and Data Acquisition section, p. 2860), connected to the sample inlet channel for delivering a flow of sample through the sample inlet channel and into the separation chamber (as demonstrated in a measurable sample flow rate, Figure 6 caption), and at least one second transfer unit, in the form of external fluid lines (second paragraph, Silicon Devices section, p. 2860) and syringe pumps (Equipment and Data Acquisition section, p. 2860), fluidly connected to the separation medium inlet channels for delivering flows of separation medium through the separation medium inlet channels and into the separation chamber (as demonstrated in a measurable carrier buffer flow rate, Figure 6 caption).

Regarding claim 29, RAYMOND teaches both the first and second transfer units are operable to control flow rate of the sample and separation medium flows to the separation chamber (Figure 6 caption).

Regarding claim 30, RAYMOND does not explicitly teach the at least one second transfer unit comprises a plurality of second transfer units fluidly connected to respective ones of the separation medium inlet channels. However, RAYMOND teaches that the second transfer unit is fluidly connected to at least one of the separation medium inlet channels (as demonstrated in a measurable carrier buffer flow rate, Figure 6 caption), and it has been held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced (*In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960)).

Regarding claims 31 and 32, the teachings of RAYMOND and holdings of precedent make the limitations of claim 30 obvious. It would be obvious to one of ordinary skill in the art that the plurality of second transfer units, in the form of external fluid lines (second paragraph, Silicon Devices section, p. 2860) and syringe pumps (Equipment and Data Acquisition section, p. 2860), could either be fluidly connected to groups of ones of the separation medium inlet channels or fluidly connected to separate ones of the separation medium inlet channels as a matter of design choice that would not impact the overall performance of the described device.

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Regarding claim 33, RAYMOND teaches each transfer unit comprises a delivery pump, in the form of syringe pumps (Equipment and Data Acquisition section, p. 2860).

Regarding claims 34 and 35, RAYMOND suggested a plurality of collection units fluidly connected to respective ones of the outlet channels for collection of a plurality of separated components, suggesting a fraction collector (second paragraph, Silicon Devices section, p. 2860).

Regarding claim 36, RAYMOND teaches a detection unit (Detection System section, p. 2860) for detecting migration of at least one separated component through at least one of the outlet channels (inset Figure 8 and Figure 9).

Regarding claims 37 and 38, RAYMOND teaches that the detection system comprises a motorized X-Y translation stage that allows scanning across the separation bed width, at various locations along its length (Equipment and Data Acquisition section, p. 2860). This, coupled with the suggestion of RAYMOND for a fraction collector (second paragraph, Silicon Devices section, p. 2860) would have made it obvious to a skilled artisan to utilize the detection unit to detect migration of separated components through any or all of the outlet

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channels because ideally the separated components will reside in a particular outlet channel of the fraction collector.

Regarding claim 39, RAYMOND teaches a free flow electrophoresis method of separating charged components, the method comprising the steps of:

providing a free flow electrophoresis microchip, comprising:

a separation chamber comprising a planar chamber (Figure 3) having a planar region (separation bed, Figure 3), in which charged components are in use separated (separation bed, Figure 3);

a plurality of separation medium inlet channels having outlets fluidly connected to one inlet side of the separation chamber (1 and 2, Figure 2; left carrier inlet and right carrier inlet, Figure 3) through which flows of a separation medium are in use introduced into the separation chamber such as to develop a laminar flow (second paragraph, Silicon Device section, p. 2860) having a flow direction through the separation chamber (carrier flow indication, Figure 1);

a sample inlet channel having an outlet fluidly connected to the inlet side of the separation chamber (3, Figure 2; sample inlet, Figure 3) through which a flow of sample containing charged components is in use introduced into the separation chamber (first paragraph, Amino Acid Separation section, p. 2863; Figure 1); a first and second electrode units (third paragraph, Silicon Devices section, p. 2860) disposed at respective ones of other lateral sides of the separation chamber (8 and 9, Figure 2).

RAYMOND suggests a plurality of outlet channels having inlets fluidly connected to another outlet side of the separation chamber opposite the inlet side thereof (second paragraph, Silicon Device section, p. 2860), although this design was not utilized in the described invention to simplify fabrication of the initial device.

RAYMOND does not teach a magnetic field unit.

However, OAKLEY discloses a microfluidic device, wherein is taught a magnetic field unit for providing a magnetic field substantially orthogonal to the flow direction of a separation medium in a microfluidic format (92, Figure 3; paragraph [0058]), wherein the magnetic field is directed substantially orthogonally to a planar region of a microchannel (44 and 92, Figure 3).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to modify the device as described by RAYMOND with the addition of the magnetic field unit as taught by OAKLEY because it would allow use of surface charge to be observed for distinguishing a particular particle in a sample (OAKLEY, paragraph [0047]).

RAYMOND also teaches applying a potential between the electrode units so as to generate an electric field across the separation chamber in a direction that would be substantially orthogonal to the magnetic field as taught by OAKLEY (Figure 1). The combination of the electric field and magnetic field would inherently yield a magnetohydrodynamic flow of sample and separation medium in the separation chamber, and RAYMOND teaches deflection of the charged

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components laterally across the separation chamber in dependence upon the charge of the charged components (Figure 1).

Regarding claim 40, RAYMOND teaches outlets of the separation medium inlet channels are disposed in a spaced relation along the inlet side of the separation chamber (Figure 3).

Regarding claim 41, RAYMOND teaches the outlet of the sample inlet channel is disposed in a central region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 42, RAYMOND teaches the outlet of the sample inlet channel is disposed in an end region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 43, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels face in the same direction (Figures 2 and 3).

Regarding claim 44, RAYMOND teaches the separation medium inlet channels are commonly fluidly connected (Figure 2).



Regarding claim 45, RAYMOND teaches groups of ones of the separation medium inlet channels are commonly fluidly connected (Figure 3).

Regarding claim 46, RAYMOND teaches the separation medium inlet channels are separately fluidly connected (Figure 3).

Regarding claim 47, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels are disposed in opposed relation to the inlets of the outlet channels (Figure 2).

Regarding claim 48, RAYMOND suggests the inlets of the outlet channels have a depth at least as great as that of the separation chamber, in that the proposed outlet array is identical to the inlet channel array (second paragraph, Silicon Devices section, p. 2860) and the inlet channel array is shown to have a depth at least as great as that of the separation chamber (Figure 3).

Regarding claim 49, RAYMOND teaches the inlets of the outlet channels are disposed in a spaced relation along the outlet side of the separation chamber (Figure 2).

Regarding claim 50, RAYMOND teaches the inlets of the outlet channels are equally spaced (Figure 2).

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Regarding claim 53, RAYMOND teaches the separation chamber has a depth of 50  $\mu\text{m}$  (first paragraph, Silicon Devices section, p. 2859).

Regarding claims 54-56, RAYMOND, as modified by OAKEY in claim 1, teaches a magnetic field unit that is a field generator (OAKEY, paragraph [0058]). Neither RAYMOND nor OAKEY teach the magnetic field unit is a magnet in the form of a Ni-Fe permalloy magnet, which is a well-known magnetic material.

However, at the time of the present invention, it would have been obvious to one of ordinary skill in the art to substitute a known element in the field generator, as taught by OAKEY, as the magnetic field unit for another known element, a Ni-Fe permalloy magnet, with a predictable result (*KSR International Co. v. Teleflex Inc.*, 550 U.S. \_\_\_, 82 USPQ2d 1385 (2007)).

Regarding claim 57, RAYMOND teaches the electrode units each comprise an electrolyte reservoir disposed adjacent the respective lateral side of the separation chamber (8 and 9, Figure 2; side beds, Figure 3) for containing a volume of an electrolyte medium, by virtue of having their own inlets (4 and 5, Figure 2) and outlets (6 and 7, Figure 2), and a plurality of connection channels fluidly connecting the electrolyte reservoir to the respective lateral side of the separation channel (side channel arrays, Figure 3).

Regarding claim 58, RAYMOND teaches each electrolyte reservoir has substantially the same length as the separation chamber (Figure 2).

Regarding claim 59, RAYMOND teaches the connection channels are disposed in a spaced relation along the respective lateral sides of the separation channel (Figure 3).

Regarding claim 60, RAYMOND teaches the connection channels are equally spaced (Figure 3).

Regarding claim 61, RAYMOND teaches the connection channels are 12  $\mu\text{m}$  wide (first paragraph, Silicon Devices section, p. 2859-2860). RAYMOND does not explicitly teach the connection channels have a width from about 1  $\mu\text{m}$  to about 5  $\mu\text{m}$ . However, it has been held where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device (*Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984)). Therefore, it would be obvious to one of skill in the art, given the width taught by RAYMOND to utilize a width in the range from about 1  $\mu\text{m}$  to about 5  $\mu\text{m}$  as it is

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merely a simple change in dimension that would not perform a different function as the width explicitly taught by RAYMOND.

Regarding claim 62, RAYMOND teaches the electrode unit each further comprises an electrode element disposed in the respective electrolyte reservoir (third paragraph, Silicon Devices section, p. 2860).

Regarding claims 63 and 64, RAYMOND suggested a plurality of collection units fluidly connected to respective ones of the outlet channels for collection of a plurality of separated components, suggesting a fraction collector (second paragraph, Silicon Devices section, p. 2860).

Regarding claim 65, RAYMOND teaches a detection unit (Detection System section, p. 2860) for detecting migration of at least one separated component through at least one of the outlet channels (inset Figure 8 and Figure 9).

Regarding claims 66 and 67, RAYMOND teaches that the detection system comprises a motorized X-Y translation stage that allows scanning across the separation bed width, at various locations along its length (Equipment and Data Acquisition section, p. 2860). This, coupled with the suggestion of RAYMOND for a fraction collector (second paragraph, Silicon Devices section, p.

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2860) would have made it obvious to a skilled artisan to utilize the detection unit to detect migration of separated components through any or all of the outlet channels because ideally the separated components will reside in a particular outlet channel of the fraction collector.

Regarding claim 68, RAYMOND teaches a free flow electrophoresis method of separating charged components, the method comprising the steps of:

providing a free flow electrophoresis microchip, comprising:

a separation chamber comprising a planar chamber (Figure 3) having a planar region (separation bed, Figure 3), in which charged components are in use separated (separation bed, Figure 3);

a plurality of separation medium inlet channels having outlets fluidly connected to one inlet side of the separation chamber (1 and 2, Figure 2; left carrier inlet and right carrier inlet, Figure 3) through which flows of a separation medium are in use introduced into the separation chamber such as to develop a laminar flow (second paragraph, Silicon Device section, p. 2860) having a flow direction through the separation chamber (carrier flow indication, Figure 1);

a sample inlet channel having an outlet fluidly connected to the inlet side of the separation chamber (3, Figure 2; sample inlet, Figure 3) through which a flow of sample containing charged components is in use introduced into the separation chamber (first paragraph, Amino Acid Separation section, p. 2863; Figure 1); and

RAYMOND suggests a plurality of outlet channels having inlets fluidly connected to another outlet side of the separation chamber opposite the inlet side thereof (second paragraph, Silicon Device section, p. 2860), although this design was not utilized in the described invention to simplify fabrication of the initial device.

RAYMOND does not teach a magnetic field unit.

However, OAKLEY discloses a microfluidic device, wherein is taught a magnetic field unit for providing a magnetic field substantially orthogonal to the flow direction of a separation medium in a microfluidic format (92, Figure 3; paragraph [0058]), wherein the magnetic field is directed substantially orthogonally to a planar region of a microchannel (44 and 92, Figure 3).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to modify the device as described by RAYMOND with the addition of the magnetic field unit as taught by OAKLEY because it would allow use of surface charge to be observed for distinguishing a particular particle in a sample (OAKLEY, paragraph [0047]).

RAYMOND also teaches supplying flows of sample and separation medium through the respective ones of the sample inlet channel and the separation medium inlet channels and into the separation chamber (fifth sentence, Equipment and Data Acquisition section, p. 2860), wherein the flow of separation medium would inherently act with the magnetic field as taught by OAKLEY to induce an electric field across the separation chamber in a direction

substantially orthogonal to the flow direction, where the inherent phenomena would act to deflect the charged components laterally across the separation chamber in dependence upon the charge of the charged components.

Regarding claim 69, RAYMOND teaches outlets of the separation medium inlet channels are disposed in a spaced relation along the inlet side of the separation chamber (Figure 3).

Regarding claim 70, RAYMOND teaches the outlet of the sample inlet channel is disposed in a central region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 71, RAYMOND teaches the outlet of the sample inlet channel is disposed in an end region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 72, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels face in the same direction (Figures 2 and 3).

Regarding claim 73, RAYMOND teaches the separation medium inlet channels are commonly fluidly connected (Figure 2).

Regarding claim 74, RAYMOND teaches groups of ones of the separation medium inlet channels are commonly fluidly connected (Figure 3).

Regarding claim 75, RAYMOND teaches the separation medium inlet channels are separately fluidly connected (Figure 3).

Regarding claim 76, RAYMOND teaches that the supplying sample and separation medium comprises the step of:

delivering sample and separation medium flow through the respective ones of sample inlet channel and separation medium inlet channels and into the separation chamber (as indicated by Sample Inlet and Carrier Flow, Figure 1).

Regarding claim 77, RAYMOND teaches the flow rates of the sample and separation medium are regulated (Figure caption 6 and Figure 7), which affects the residence time of the sample in the separation chamber, which will in turn determine the length of time the sample is subject to the fields and this will control the lateral deflection of the sample charged components.

Regarding claim 78, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels are disposed in opposed relation to the inlets of the outlet channels (Figure 2).



Regarding claim 79, RAYMOND suggests the inlets of the outlet channels have a depth at least as great as that of the separation chamber, in that the proposed outlet array is identical to the inlet channel array (second paragraph, Silicon Devices section, p. 2860) and the inlet channel array is shown to have a depth at least as great as that of the separation chamber (Figure 3).

Regarding claim 80, RAYMOND teaches the inlets of the outlet channels are disposed in a spaced relation along the outlet side of the separation chamber (Figure 2).

Regarding claim 81, RAYMOND teaches the inlets of the outlet channels are equally spaced (Figure 2).

Regarding claim 84, RAYMOND teaches the separation chamber has a depth of 50  $\mu\text{m}$  (first paragraph, Silicon Devices section, p. 2859).

Regarding claims 85-87, RAYMOND, as modified by OAKEY in claim 1, teaches a magnetic field unit that is a field generator (OAKEY, paragraph [0058]). Neither RAYMOND nor OAKEY teach the magnetic field unit is a magnet in the form of a Ni-Fe permalloy magnet, which is a well-known magnetic material.

However, at the time of the present invention, it would have been obvious to one of ordinary skill in the art to substitute a known element in the field generator, as taught by OAKLEY, as the magnetic field unit for another known element, a Ni-Fe permalloy magnet, with a predictable result (*KSR International Co. v. Teleflex Inc.*, 550 U.S. \_\_\_, 82 USPQ2d 1385 (2007)).

Regarding claim 88, RAYMOND teaches the microchip further comprising: first and second electrode units (third paragraph, Silicon Devices section, p. 2860) disposed at respective ones of other lateral sides of the separation chamber (8 and 9, Figure 2).

Regarding claim 89, RAYMOND teaches the electrode units each comprise an electrolyte reservoir disposed adjacent the respective lateral side of the separation chamber (8 and 9, Figure 2; side beds, Figure 3) for containing a volume of an electrolyte medium, by virtue of having their own inlets (4 and 5, Figure 2) and outlets (6 and 7, Figure 2), and a plurality of connection channels fluidly connecting the electrolyte reservoir to the respective lateral side of the separation channel (side channel arrays, Figure 3).

Regarding claim 90, RAYMOND teaches each electrolyte reservoir has substantially the same length as the separation chamber (Figure 2).

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Regarding claim 91, RAYMOND teaches the connection channels are disposed in a spaced relation along the respective lateral sides of the separation channel (Figure 3).

Regarding claim 92, RAYMOND teaches the connection channels are equally spaced (Figure 3).

Regarding claim 93, RAYMOND teaches the connection channels are 12  $\mu\text{m}$  wide (first paragraph, Silicon Devices section, p. 2859-2860). RAYMOND does not explicitly teach the connection channels have a width from about 1  $\mu\text{m}$  to about 5  $\mu\text{m}$ . However, it has been held where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device (*Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984)). Therefore, it would be obvious to one of skill in the art, given the width taught by RAYMOND to utilize a width in the range from about 1  $\mu\text{m}$  to about 5  $\mu\text{m}$  as it is merely a simple change in dimension that would not perform a different function as the width explicitly taught by RAYMOND.

Regarding claim 94, RAYMOND teaches the electrode unit each further comprises an electrode element disposed in the respective electrolyte reservoir (third paragraph, Silicon Devices section, p. 2860).

Regarding claims 95 and 96, RAYMOND suggested a plurality of collection units fluidly connected to respective ones of the outlet channels for collection of a plurality of separated components, suggesting a fraction collector (second paragraph, Silicon Devices section, p. 2860).

Regarding claim 97, RAYMOND teaches a detection unit (Detection System section, p. 2860) for detecting migration of at least one separated component through at least one of the outlet channels (inset Figure 8 and Figure 9).

Regarding claims 98 and 99, RAYMOND teaches that the detection system comprises a motorized X-Y translation stage that allows scanning across the separation bed width, at various locations along its length (Equipment and Data Acquisition section, p. 2860). This, coupled with the suggestion of RAYMOND for a fraction collector (second paragraph, Silicon Devices section, p. 2860) would have made it obvious to a skilled artisan to utilize the detection unit to detect migration of separated components through any or all of the outlet channels because ideally the separated components will reside in a particular outlet channel of the fraction collector.

***Response to Arguments***

4. Applicant's arguments filed April 13, 2010, have been fully considered but they are not persuasive. First the Applicant argues that the field generator of OAKLEY et al. is a component of an imaging system, and therefore is separate from the microfluidic devices (Remarks, p. 16). However, OAKLEY teaches the field generator that provides the magnetic field is directly associated with the microfluidic system (Figure 3; paragraph [0065]). Therefore, the argument that the field generator is a component of an imaging system and is separate from the microfluidic device is not persuasive to make the claims non-obvious in light of the combined teachings of RAYMOND et al. in view of OAKLEY et al. to describe an overall system.

Next, the Applicant argues that no skilled person would have had no conceivable reason to contemplate the implementation of the field generator of OAKLEY et al. within a microfluidic device, such as the kind of Raymond et al. (Remarks, paragraph bridging p. 6-7). In response to applicant's argument that there is no teaching, suggestion, or motivation to combine the references, the examiner recognizes that obviousness may be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988),

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*In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992), and *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 82 USPQ2d 1385 (2007). In this case, it would have been obvious to one of ordinary skill in the art to modify the device as described by RAYMOND with the addition of the magnetic field unit as taught by OAKLEY because it would allow use of surface charge to be observed for distinguishing a particular particle in a sample (OAKLEY, paragraph [0047]).

Finally, the Applicant argues that were the field generator as taught by OAKLEY et al. to be incorporated into the microfluidic device of RAYMOND et al. that the field generator would be required to induce a field transversely across the separation bed, parallel to the separation bed and not substantially orthogonal to the planar separation bed (Remarks, p. 17). However, OAKLEY shows the field generator (92, Figure 3) situated below the plane in which the microchannels are situated (44, Figure 3), which makes the field substantially orthogonal to the flow direction. Additionally, OAKLEY demonstrates that such a configuration will cause lateral movement of particles within the separation bed (Figures 5A-C; Figures 6A-C; Figures 7A-C). Therefore, it is not a persuasive argument that the field generator as taught by OAKLEY et al. to be incorporated into the microfluidic device of RAYMOND et al. that the field generator would be required to induce a field transversely across the separation bed.

***Conclusion***

5. The prior art made of record and not relied upon at this time, but is considered pertinent to applicant's disclosure.

BLANKENSTEIN (US 6,432,630 B1 & corresponding WO 98/10267), that discloses a micro-flow system for particle separation and analysis comprising a magnet (8, Figure 1) to generate lateral movement of particles in a separation bed (5, Figure 1).

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. CHRISTOPHER BALL whose telephone number is (571)270-5119. The examiner can normally be reached on Monday through Thursday, 9 am to 5 pm Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/  
Supervisory Patent Examiner, Art Unit 1753

JCB  
07/08/2010